

### ABSTRACT OF THE DISCLOSURE

A radiation-heated fluidized-bed reactor and a process for producing high-purity polycrystalline silicon by using this reactor. The fluidized-bed reactor (1) has the following components:

- a) a pressure-supporting enclosure (2)
- b) an inner reactor tube (3) made from a material which exhibits high transmission for thermal radiation
- c) an inlet (4) for silicon particles (5),
- d) an inlet device (6) for supplying a reaction gas (7) which contains a silicon compound in gas or vapor form, the inlet device (6) being of tubular design and dividing the fluidized bed into a heating zone and a reaction zone situated above it,
- e) a gas-distribution device (8) for feeding a fluidizing gas (9) into the heating zone
- f) an outlet (10) for reaction gas which has not fully reacted, fluidizing gas and the products of the reaction (11) which are in gas or vapor form
- g) an outlet (12) for the product (13)
- h) a heater device (14),
- i) an energy supply (15) for the heater device (14).

In this reactor, the heater device (14) is a radiation source for thermal radiation which is arranged outside the inner reactor tube and as a ~~ring~~<sup>cylinder</sup> around the heater zone, without being <sup>we 27/3/2000</sup> ~~in~~<sup>of 10.00</sup> direct contact with the inner reactor tube, and is designed in <sup>roughly</sup> such a manner that it uses thermal radiation to heat the silicon particles in the heating zone to a temperature which is such that the reaction temperature is established in the reaction zone.